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BIOCHEMICAL PLASTICITY AMONG DIFFERENTIALLY HOUSED MICE. W.B. Essman, Queens College of the C.U.N.Y., Flushing, New York (U.S.A.)

Attending several behavioral changes among different inbred strains of mice, housed either in isolation or in groups, such as avoidance acquisition deficits, aggressive behaviors, and changes in sleep behavior and activation, endogenously or through the effects of psychoactive drugs, are numerous alterations in neurochemical parameters of functional status. Isolation provided for a decrease in the RNA content of cerebellar neurons (34.1 to 19.50 µg/cell), whereas glial RNA content was increased (45.2 to 78.3 µg/cell). Synaptosomal RNA from cerebral cortex was markedly decreased as a consequence of isolation (10.8 to 1.9 µg/mg protein), and there were comparable reductions in various organelle fractions derived from such nerve endings. 5-HT uptake by cerebral cortex nerve endings was significantly reduced (64%) and non-linear with concentration as a consequence of isolation. Isolation housing led to an increase in cerebral lipid synthesis (31%) with decreased lipid synthesis in liver (59%) and unchanged synthesis in kidney. ECS, while significantly increasing brain lipid synthesis in both isolated (4.0 X) and grouped (5.6 X) mice did not appreciably affect synthesis by liver or kidney. Receptor antagonism of 5-HT with methysergide (1.0 gm/kg) potentiated isolation-induced increases in brain lipid synthesis (21%), as did scopolamine (1.3 mg/kg - 61%); however, benzodiazepines (25 mg/kg) did not alter this effect of isolation.

Incubation of isolated microsomal fractions from cerebral and cerebellar cortex of isolated and grouped mice in the presence of 5-HT led to significant inhibition of C^{14}-leucine incorporation into microsomal proteins (25% and 94% respectively) in tissues from grouped mice. Among isolated animals, the respective effects of 5-HT were significantly reduced to 8 and 33%, respectively.

Isolated male mice showed increased synaptosomal uptake of 5-HT in the cerebral cortex (33%) and cerebellar cortex (14%), whereas 5-HT uptake by synaptosomes in female mice was not significantly altered by isolation.

Isolated mice had significantly ($p<.01$) decreased activity of acetylcholinesterase (AChE) in the frontal (71%), parietal (56%), temporal (63%), and occipital (59%) cortex; however, environmental stimulation (tactile, auditory, visual, and vestibular) for 7 days altered AChE activity. Grouped mice showed significant decreases in enzyme activity in frontal (49%), parietal (41%), temporal (50%), and occipital (46%) cortex, whereas stimulated isolated mice showed significantly increased AChE activity in frontal (150%) and temporal (52%) cortex; enzyme activity in these regions was now comparable to that of non-stimulated grouped mice and exceeded that of stimulated grouped animals. The subsynaptic distribution of AChE in fractions from the cerebral cortex was also modified by isolation. Enzyme activity associated with small external synaptic membrane fragments (MFα) was significantly reduced, as compared with that obtained from grouped conditions (0.15 A.U./mg/min. to 0.03 A.U./mg/min.). Isolation provided for increased synaptosomal acetylcholine (ACh) levels (400 ± 0.93) as compared with grouped animals (2.40 ± 0.72 µMoles/g).

The plasticity of CNS biochemical alteration resulting from isolation housing appears important for the behavioral and pharmacological changes for which such differential housing provides.